

## 4. PRODUCTION, IMPORT, USE, AND DISPOSAL

### 4.1 PRODUCTION

Naphthalene may be produced from either coal tar or petroleum. Distillation and fractionation of coal tar is the most common production process. The middle fraction (containing most of the naphthalene) is cooled, crystallizing the naphthalene. The crude naphthalene may be refined by distillation, washing, and sublimation (Coons et al. 1982; Hughes et al. 1985). 1-Methylnaphthalene and 2-methylnaphthalene are also produced from coal tar by first extracting the heteroaromatics and phenols, then filtering off the crystallized 2-methylnaphthalene and redistilling the filtrate to yield 1-methylnaphthalene (GDCH 1992; Sax and Eewis 1987).

Since 1960, recovery of naphthalene from petroleum by dealkylation of methyl naphthalenes in the presence of hydrogen at high temperature and pressure has become a commercial production process. The naphthalene is then recovered by fractionation, decolorized, and purified by crystallization. Naphthalene produced from petroleum is about 99% pure. In the United States, most naphthalene is produced from petroleum (Coons et al. 1982; Hughes et al. 1985).

The production volume of naphthalene in the United States decreased significantly from a peak of 900 million pounds (409,000 metric tons) in 1968 to 354 million pounds (161,000 metric tons) in 1982. Production capacity has remained relatively stable in recent years, with estimated capacity for 1992 at 349 million pounds (159,000 metric tons) (Hughes et al. 1985; SRI 1992).

There are currently four companies in the United States producing naphthalene: Allied-Signal, Inc., Ironton, Ohio; Chemical Exchange Industries, Inc., Baytown, Texas; Koppers Industries, Inc., Follansbee, West Virginia; and Texaco, Inc., Delaware City, Delaware. Koppers Industries, Inc. produces 1-methylnaphthalene; Koch Industries, Inc., Corpus Christi, Texas, produces 2-methylnaphthalene; and Crowley Chemical Company, Inc., Kent, Ohio and Oklahoma City, Oklahoma, produces 1-methylnaphthalene/2-methylnaphthalene (mixed isomers) (SRI 1992). No data on production volume of 1-methylnaphthalene or 2-methylnaphthalene were located.

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Table 4-1 lists information on United States companies that reported the manufacture and use of naphthalene in 1992 (TR192 1994). The TRI data should be used with caution since only certain types of facilities are required to report. This is not an exhaustive list. 1-methylnaphthalene and 2-methylnaphthalene are not included in the list of chemicals for which reporting is required for the TRI.

## 4.2 IMPORT/EXPORT

In 1978, about 7 million pounds (3,260 metric tons) of naphthalene were imported to the United States and 9 million pounds (3,960 metric tons) were exported from the United States. More recently, imports decreased to about 4 million pounds (2,000 metric tons), while exports increased to 21 million pounds (10,000 metric tons) in 1989 (CEH 1993; Coons et al. 1982). In 1986, 24,400 pounds of 1-methylnaphthalene were imported in the United States (HSDB 1995). No information was located on import or export quantities of 2-methylnaphthalene.

## 4.3 USE

The principal end use for naphthalene is as an intermediate in the production of phthalic anhydride (more than 60% of consumption), which is used as an intermediate in the production of phthalate plasticizers, resins, phthaleins, dyes, pharmaceuticals, insect repellents, and other materials. It is also used in the production of the insecticide carbaryl, synthetic leather tanning agents and surface active agents (naphthalene sulfonates and derivatives, which are used as dispersants or wetting agents in paint, dye, and paper-coating formulations), and miscellaneous organic chemicals, including dyes and resins. Crystalline naphthalene is also used as a moth repellent. In 1989 about 12 million pounds (5,500 metric tons) of naphthalene were used for this purpose (CEH 1993; Coons et al. 1982; HSDB 1995). Crystalline naphthalene has also been used as a solid block deodorizer for diaper pails and toilets (Haggerty 1956). Also, in the early 1900's naphthalene was used medicinally as an antiseptic, expectorant, and anthelmintic (Grant 1986; Lenzenius 1902). It was commonly administered for diseases of the gastrointestinal tract and applied externally for treatment of skin disorders (Lenzenius 1902).

It is anticipated that consumption of naphthalene for phthalic anhydride and production of naphthalene sulfonates will increase due to increased demand for these products. The use of naphthalene as a moth

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Table 4-1. Facilities That Manufacture or Process Napthalene

State <sup>a</sup>	Number of facilities	Range of maximum amounts on site in thousands of pounds <sup>b</sup>	Activities and uses <sup>c</sup>
AK	1	100-1000	8
AL	18	1-10000	1, 2, 3, 4, 6, 8, 9, 11, 12, 13
AR	3	1-1000	8, 10, 11, 13
AZ	2	1-100	8, 12
CA	39	0-10000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
CO	1	100-1000	7, 11
CT	2	1-1000	7, 11
DE	1	10000-50000	1, 4, 6
FL	4	0-100	8, 9
GA	13	1-1000	1, 5, 6, 7, 8, 9, 12, 13
HI	2	100-10000	1, 2, 6, 8, 12
IA	6	0-1000	1, 4, 5, 8, 11, 12
IL	33	1-10000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
IN	17	0-10000	1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13
KS	6	0-100	1, 6, 8, 10, 11, 12, 13
KY	16	0-50000	1, 3, 4, 5, 6, 8, 11, 12, 13
LA	27	0-500000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
MA	1	1-10	13
MD	2	1-100	2, 3, 7, 8, 11
MI	13	0-1000	1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13
MN	3	0-10000	1, 4, 6, 12
MO	8	1-1000	7, 8, 10, 13
MS	10	0-10000	1, 2, 6, 8, 10, 11, 12
MT	3	100-10000	1, 3, 4, 6, 7, 8, 11
NC	6	1-100	2, 3, 7, 8, 12, 13
ND	2	0-10000	7, 13
NE	3	1-100	11, 12, 13
NJ	19	0-50000	1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13
NM	1	100-1000	8
NY	3	10-1000	1, 4, 5, 6, 8
OH	34	0-50000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
OK	6	1-100000	1, 2, 3, 6, 7, 9, 11, 13
PA	27	1-50000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
PR	4	0-50000	1, 6, 8, 13
SC	7	0-100	1, 6, 7, 8, 12
SD	1	1-10	8
TN	9	0-50000	1, 3, 7, 8, 9, 10, 11, 12, 13
TX	77	0-50000	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
UT	7	1-50000	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13
VA	5	1-100	8, 9, 11, 12, 13
VI	2	1-50000	1, 2, 3, 4, 7, 13
WA	8	1-50000	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13
WI	4	1-100	8, 11, 13
WV	7	0-50000	1, 5, 6, 7, 8, 9, 11, 12
WY	4	1-10000	1, 3, 4, 5, 6, 7, 8, 11

Source: TRI92 1994

<sup>a</sup> Post office state abbreviations used<sup>b</sup> Data in TRI are maximum amounts on site at each facility.<sup>c</sup> Activities/Uses:

- |                               |                                  |
|-------------------------------|----------------------------------|
| 1. Produce                    | 8. As a formulation component    |
| 2. Import                     | 9. As a product component        |
| 3. For on-site use/processing | 10. For repackaging              |
| 4. For sale/distribution      | 11. As a chemical processing aid |
| 5. As a byproduct             | 12. As a manufacturing aid       |
| 6. As an impurity             | 13. Ancillary or other uses      |
| 7. As a reactant              |                                  |

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repellent may also increase if alternative moth repellents are shown to cause carcinogenic effects. About 15-16 million pounds (6,800-7,300 metric tons) of naphthalene are expected to be used for moth repellents by 1994 (CEH 1993).

1-Methylnaphthalene is used in the synthesis of 1-methylnaphthoic acid and, to a lesser degree, as a dyeing agent and as a test substance for determining the ignition capability of diesel fuels.

2-Methylnaphthalene is used in vitamin K production by oxidation to 2-methyl-1,4-naphthoquinone, which can then be reacted to phytomenadione (vitamin K). It can also be chlorinated and oxidized to form dyes and small amounts in sulfonated form are used as textile aids, wetting agents, and emulators (GDCH 1992).

#### 4.4 DISPOSAL

Naphthalene and waste containing naphthalene are classified as hazardous wastes by EPA. Generators of waste containing this contaminant must conform to EPA regulations for treatment, storage, and disposal (see Chapter 7). Rotary kiln or fluidized bed incineration methods are acceptable disposal methods for these wastes (EPA 1988a, 1989e).

According to the Toxics Release Inventory (TRI), about 1.8 million pounds of naphthalene were transferred to landfills and/or treatment/disposal facilities in 1990 and 210,000 pounds were transferred to publicly owned treatment works (POTW) (see Section 5.2). Although data on quantities of naphthalene disposed of by various disposal methods in the past were not located, it was estimated that about 524,000 pounds (238 metric tons) of naphthalene were disposed of on land and 504,000 pounds (229 metric tons) were discharged to POTWs from production and inadvertent sources in 1978 (Coons et al. 1982).

No information was located on disposal methods or quantities of wastes containing 1-methylnaphthalene or 2-methylnaphthalene. However, these chemicals have been detected at hazardous waste sites (see Section 5.1).